DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name	Target Direction	Slot	N / S	E / W	Hole Size	Calculation by	Date
Bernice 2-17H	357.89	Coordinate					4/18/12
Job Number	Type of Survey	Tie-in Point				Directional Co.	
0							

Meaured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate N + / S -	E + / W -	Dogleg Severity	Build Up °/100 ft	Walk/ °/100 ft
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
247	1	293	247	246.99	0.82	0.75	-1.79	0.36	0.36	118.54
465	3	293	218	464.86	3.86	3.55	-8.45	0.92	0.92	0.00
590	3	293	125	589.70	6.48	5.96	-14.18	0.08	-0.08	0.00
733	3	293	143	732.55	9.32	8.57	-20.39	0.14	-0.14	0.00
775	2	293	42	774.51	10.09	9.28	-22.08	0.48	-0.48	0.00
867	2	293	92	866.43	11.64	10.71	-25.48	0.22	-0.22	0.00
959	2	294	92	958.37	13.05	12.01	-28.51	0.33	-0.33	0.98
1050	2	286	91	1,049.32	14.20	13.05	-31.42	0.31	0.11	-8.57
1141	2	294	91	1,140.27	15.31	14.06	-34.25	0.36	-0.22	8.79
1413	2	281	272	1,412.14	18.10	16.57	-42.12	0.15	-0.04	-4.74
1890	1	308	477	1,889.01	22.36	20.45	-52.36	0.19	-0.15	5.56
2366	1	296	476	2,364.96	26.38	24.25	-58.27	0.07	-0.06	-2.42
2843	0	310	477	2,841.94	28.31	26.07	-61.53	0.11	-0.10	3.02
3319	0	70	476	3,317.94	29.26	27.04	-60.99	0.09	0.02	-50.55
3415	0	68	96	3,413.94	29.40	27.19	-60.60	0.10	-0.10	-1.77
3510	0	15	95	3,508.94	29.77	27.57	-60.36	0.34	0.21	-56.00
3605	0	298	95	3,603.94	30.17	27.97	-60.42	0.43	-0.21	298.21
3701	0	53	96	3,699.94	30.35	28.15	-60.43	0.35	0.00	-255.52
3796	1	69	95	3,794.94	30.64	28.46	-59.76	0.54	0.53	16.84
3891	0	66	95	3,889.93	30.95	28.80	-58.92	0.32	-0.32	-3.37
3923	1	45	32	3,921.93	31.11	28.97	-58.70	0.84	0.63	-66.25
3955	2	8	32	3,953.92	31.69	29.56	-58.51	3.95	3.44	-112.81
3987	4	8	32	3,985.89	33.15	31.02	-58.31	5.94	5.94	-2.50
4019	5	3	32	4,017.79	35.64	33.52	-58.10	5.73	5.63	-14.38
4050	7	4	31	4,048.60	39.02	36.92	-57.90	5.81	5.81	1.61
4082	9	3	32	4,080.27	43.54	41.45	-57.65	5.94	5.94	-1.56
4114	11	4	32	4,111.77	49.15	47.08	-57.31	6.58	6.56	2.50
4146	13	3	32	4,143.04	55.91	53.85	-56.92	6.59	6.56	-2.81
4177	15	3	31	4,173.07	63.56	61.53	-56.53	6.77	6.77	0.00
4209	17	2	32	4,203.77	72.57	70.55	-56.16	6.32	6.25	-3.44
4241	19	0	32	4,234.13	82.66	80.65	-55.99	6.45	6.25	-5.00
4273	22	359	32	4,264.02	94.06	92.07	-56.05	9.43	9.38	1,122.19
4304	26	1	31	4,292.29	106.76	104.77	-56.05	11.74	11.61	########
4336	29	1	32	4,320.69	121.49	119.52	-55.81	9.10	9.06	1.88
4368	31	3	32	4,348.44	137.37	135.43	-55.21	6.63	5.94	5.94
4400	33	5	32	4,375.59	154.21	152.32	-54.05	7.66	7.19	5.00
4432	36	5	32	4,402.03	172.12	170.30	-52.60	7.51	7.50	-0.63
4463	37	5	31	4,427.06	190.28	188.52	-51.14	4.21	4.19	0.65
4495	38	5	32	4,452.44	209.62	207.94	-49.54	4.38	4.38	0.00
4527	40	4	32	4,477.29	229.65	228.04	-48.03	5.54	5.31	-2.50
4559	42	4	32	4,501.48	250.50	248.95	-46.68	6.30	6.25	-1.25
4591	44	3	32	4,524.90	272.20	270.72	-45.47	6.69	6.56	-1.88
4622	46	2	31	4,546.84	294.03	292.59	-44.46	6.23	6.13	-1.61
4654	47	3	32	4,568.83	317.20	315.82	-43.42	4.43	4.38	0.94
4686	50	3	32	4,590.07	341.04	339.72	-42.23	6.91	6.88	0.94
4718	51	3	32	4,610.62	365.47	364.21	-40.88	3.51	3.44	0.94
4749	51	4	31	4,630.21	389.38	388.19	-39.44	1.49	1.29	0.97
4781	51	3	32	4,650.28	414.18	413.07	-37.94	1.19	0.94	-0.94
4813	51	3	32	4,670.38	438.98	437.93	-36.52	1.27	-1.25	-0.31
4845	50	4	32	4,690.71	463.57	462.60	-35.06	2.39	-2.19	1.25
4876	49	3	31	4,710.85	487.05	486.13	-33.80	5.26	-4.52	-3.55
4908	50	2	32	4,731.67	511.27	510.41	-32.79	3.78	3.75	-0.63
4940	52	3	32	4,751.81	536.05	535.25	-31.63	6.48	6.25	2.19
4972	55	5	32	4,770.95	561.55	560.83	-29.88	9.02	7.81	5.63
5004	58	4	32	4,788.80	587.93	587.30	-27.80	10.12	10.00	-1.88
5035	61	4	31	4,804.58	614.46	613.92	-25.99	11.09	10.97	-1.94
5067	65	3	32	4,819.18	642.81	642.35	-24.48	11.36	10.94	-3.44
5099	68	2	32	4,832.09	672.01	671.60	-23.41	10.26	10.00	-2.50
5131	71	1	32	4,843.45	701.86	701.50	-22.60	8.79	8.75	-0.94
5162	73	1	31	4,853.03	731.29	730.98	-21.98	9.12	9.03	-1.29
5194	78	1	32	4,861.07	762.21	761.94	-21.47	12.82	12.81	-0.31
5226	82	0	32	4,866.84	793.65	793.41	-21.17	13.30	13.13	-2.19
5258	84	359	32	4,870.71	825.39	825.17	-21.31	8.89	8.44	1,122.19
5289	87	359	31	4,873.17	856.29	856.06	-21.82	6.96	6.77	-1.61
5359	90	359	70	4,875.37	926.24	926.00	-23.47	4.88	4.86	-0.43
5391	91	359	32	4,875.15	958.23	957.99	-24.28	3.14	3.13	0.31
5423	92	358	32	4,874.45	990.22	989.97	-25.12	2.27	2.19	-0.63
5519	90	358	96	4,873.53	1,086.21	1,085.92	-27.97	2.20	-2.19	-0.21
5614	90	359	95	4,874.19	1,181.20	1,180.89	-30.20	0.97	0.21	0.95
5710	90	359	96	4,874.86	1,277.18	1,276.86	-32.13	0.56	-0.21	-0.52
5806	89	359	96	4,876.29	1,373.16	1,372.82	-34.48	0.73	-0.73	0.00
5901	90	359	95	4,877.53	1,468.15	1,467.79	-36.80	0.95	0.95	0.00
5997	89	358	96	4,878.54	1,564.14	1,563.74	-39.64	0.88	-0.63	-0.63
6093	90	356	96	4,879.29	1,660.12	1,659.59	-44.75	2.38	0.94	-2.19
6188	90	356	95	4,879.70	1,755.05	1,754.32	-51.87	0.67	-0.53	-0.42
6284	92	357	96	4,878.45	1,850.98	1,850.07	-58.57	2.80	2.60	1.04
6347	92	357	63	4,876.30	1,913.92	1,912.92	-62.41	0.16	-0.16	0.00
6379	92	357	32	4,875.19	1,945.89	1,944.85	-64.26	1.40	0.62	1.25
6443	92	357	64	4,872.90	2,009.84	2,008.71	-67.77	0.22	-0.16	-0.16
6477	92	357	34	4,871.80	2,043.82	2,042.64	-69.73	1.06	-0.88	-0.59
6572	94	357	95	4,867.16	2,138.68	2,137.36	-75.11	2.34	2.32	0.32
6668	95	357	96	4,859.71	2,234.37	2,232.91	-80.61	1.22	1.15	-0.42
6700	94	356	32	4,857.23	2,266.26	2,264.74	-82.78	4.25	-3.44	-2.50
6732	94	355	32	4,855.02	2,298.15	2,296.56	-85.37	2.20	0.31	-2.19
6764	94	354	32	4,852.76	2,330.01	2,328.34	-88.38	2.51	0.31	-2.50
6795	94	353	31	4,850.63	2,360.85	2,359.07	-91.88	4.61	-0.97	-4.52
6827	94	353	32	4,848.37	2,392.64	2,390.72	-95.96	1.82	1.56	-0.94
6859	93	353	32	4,846.44	2,424.44	2,422.40	-100.07	5.35	-5.31	0.62
6891	90	353	32	4,845.69	2,456.31	2,454.15	-104.00	7.97	-7.81	1.56
6934	89	354	43	4,845.99	2,499.19	2,496.88	-108.79	2.98	-2.33	1.86
6966	88	356	32	4,846.69	2,531.13	2,528.73	-111.72	5.17	-2.19	4.69

DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name	Target Direction	Slot Coordinate	N / S	E / W	Hole Size	Calculation by	Date
Bernice 2-17H	357.89						4/18/12
Job Number	Type of Survey	Tie-in Point				Directional Co.	
0							

Meaured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate N + / S -	E + / W -	Dogleg Severity	Build Up °/100 ft	Walk/ °/100 ft
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
6998	87	357	32	4,847.86	2,563.09	2,560.64	-113.84	5.37	-3.13	4.37
7029	87	358	31	4,849.51	2,594.05	2,591.56	-115.27	4.10	-2.90	2.90
7061	87	357	32	4,851.32	2,626.00	2,623.48	-116.67	2.44	1.56	-1.88
7125	88	358	64	4,853.95	2,689.94	2,687.37	-119.29	2.47	2.03	1.41
7221	89	359	96	4,856.29	2,785.91	2,783.30	-122.13	0.75	0.63	0.42
7316	88	359	95	4,859.03	2,880.86	2,878.23	-124.45	1.18	-1.16	0.21
7412	91	359	96	4,860.37	2,976.82	2,974.20	-126.05	3.01	2.92	0.73
7475	91	360	63	4,859.32	3,039.78	3,037.19	-126.49	1.28	1.11	0.63
7507	91	1	32	4,858.60	3,071.75	3,069.18	-126.35	2.81	0.00	#######
7603	92	359	96	4,856.17	3,167.65	3,165.14	-126.26	1.39	0.31	373.65
7699	90	359	96	4,855.16	3,263.62	3,261.12	-127.85	2.21	-2.08	-0.73
7794	91	359	95	4,855.08	3,358.60	3,356.10	-129.93	0.95	0.95	0.11
7841	90	359	47	4,854.83	3,405.60	3,403.09	-130.83	0.95	-0.85	0.43
7937	90	359	96	4,854.58	3,501.57	3,499.08	-132.17	0.43	0.10	0.42
8032	91	0	95	4,853.51	3,596.51	3,594.07	-132.50	1.27	0.95	-378.11
8128	91	360	96	4,851.91	3,692.43	3,690.06	-132.58	0.61	-0.31	374.48
8223	92	359	95	4,849.76	3,787.38	3,785.02	-133.83	1.42	1.05	-0.95
8319	91	358	96	4,847.75	3,883.35	3,880.96	-136.59	1.56	-1.25	-0.94
8415	92	358	96	4,845.49	3,979.33	3,976.86	-140.11	1.56	1.56	0.00
8513	90	358	98	4,843.35	4,077.30	4,074.78	-143.44	1.76	-1.73	0.31
8609	89	359	96	4,844.27	4,173.29	4,170.73	-146.20	2.00	-1.98	0.31
8705	90	359	96	4,845.28	4,269.27	4,266.69	-148.47	1.90	1.88	0.31
8800	89	359	95	4,846.02	4,364.24	4,361.68	-149.96	1.70	-1.58	0.63
8896	91	359	96	4,846.36	4,460.22	4,457.66	-151.63	2.24	2.08	-0.83
8991	90	359	95	4,845.69	4,555.21	4,552.62	-153.95	0.84	-0.84	0.00
9087	90	359	96	4,845.86	4,651.19	4,648.61	-155.63	0.86	-0.21	0.83
9183	90	359	96	4,846.20	4,747.16	4,744.60	-156.72	0.10	0.00	-0.10
9278	91	360	95	4,845.62	4,842.11	4,839.60	-157.30	1.37	1.16	0.74
9374	90	359	96	4,845.03	4,938.06	4,935.59	-157.80	1.31	-1.15	-0.63
9469	90	0	95	4,845.61	5,033.00	5,030.59	-158.22	0.80	-0.32	-378.21
9565	93	1	96	4,843.93	5,128.87	5,126.55	-157.13	3.33	3.13	1.15
9661	92	359	96	4,839.91	5,224.70	5,222.47	-156.71	1.99	-0.21	373.02
9756	91	358	95	4,837.34	5,319.65	5,317.40	-158.86	2.02	-1.58	-1.26
9852	89	357	96	4,837.18	5,415.64	5,413.30	-163.14	1.99	-1.46	-1.35
9947	91	357	95	4,837.09	5,510.63	5,508.17	-168.11	1.43	1.37	0.42
9979	89	356	32	4,837.12	5,542.62	5,540.11	-169.98	5.81	-4.69	-3.44
10011	92	357	32	4,836.90	5,574.60	5,572.05	-171.99	7.73	7.50	1.87
10043	91	357	32	4,836.20	5,606.59	5,603.99	-173.83	2.19	-2.19	0.00
10075	88	355	32	4,836.65	5,638.56	5,635.89	-176.14	11.88	-10.63	-5.31
10107	88	355	32	4,837.79	5,670.49	5,667.74	-179.07	3.22	2.81	-1.56
10139	89	355	32	4,838.43	5,702.43	5,699.60	-182.00	3.22	2.81	1.56
10171	90	354	32	4,838.71	5,734.38	5,731.45	-185.04	3.08	1.25	-2.81
10202	88	355	31	4,839.31	5,765.32	5,762.30	-187.98	5.92	-5.16	2.90
10234	88	355	32	4,840.48	5,797.26	5,794.16	-190.77	1.25	-1.25	0.00
10266	88	355	32	4,841.82	5,829.18	5,826.00	-193.64	1.13	-0.63	-0.94
10298	88	354	32	4,843.19	5,861.10	5,857.83	-196.67	0.99	0.31	-0.94
10330	87	356	32	4,844.64	5,893.03	5,889.68	-199.43	4.25	-1.25	4.06
10362	88	355	32	4,846.06	5,924.96	5,921.53	-202.11	3.49	1.56	-3.13
10394	87	354	32	4,847.49	5,956.87	5,953.35	-205.17	2.00	-1.56	-1.25
10426	87	354	32	4,849.25	5,988.75	5,985.14	-208.43	2.38	-2.19	-0.94
10490	86	355	64	4,853.21	6,052.53	6,048.74	-214.38	2.03	-0.16	2.03
10521	86	356	31	4,855.32	6,083.43	6,079.58	-216.70	3.22	-1.94	2.58
10553	87	356	32	4,857.47	6,115.34	6,111.43	-218.90	2.21	2.19	-0.31
10585	87	357	32	4,859.20	6,147.28	6,143.31	-220.99	2.95	2.50	1.56
10617	88	358	32	4,860.65	6,179.25	6,175.24	-222.64	3.49	0.63	3.44
10681	88	357	64	4,862.94	6,243.20	6,239.13	-225.54	1.54	1.41	-0.63
10712	89	358	31	4,863.64	6,274.19	6,270.09	-226.97	2.16	1.94	0.97
10744	89	357	32	4,864.20	6,306.19	6,302.05	-228.42	0.62	0.00	-0.62
10776	89	358	32	4,864.73	6,338.18	6,334.02	-229.65	3.14	0.31	3.13
10808	89	358	32	4,865.18	6,370.18	6,366.00	-230.65	0.88	0.63	-0.62
10840	89	357	32	4,865.54	6,402.18	6,397.97	-231.94	2.52	0.31	-2.50
10872	90	358	32	4,865.65	6,434.18	6,429.95	-233.14	4.25	2.50	3.44
10904	90	358	32	4,865.51	6,466.17	6,461.94	-234.09	0.70	0.31	-0.62
10935	90	358	31	4,865.38	6,497.17	6,492.92	-235.04	0.46	-0.32	0.32
10999	90	359	64	4,865.04	6,561.17	6,556.90	-236.82	0.44	0.31	0.31
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			

DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name	Target Direction	Slot Coordinate	N / S	E / W	Hole Size	Calculation by	Date
Bernice 2-17H	357.89						4/18/12
Job Number	Type of Survey	Tie-in Point				Directional Co.	
0							

Meaured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate N + / S -	E + / W -	Dogleg Severity	Build Up °/100 ft	Walk/ °/100 ft
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
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0	0	0		4,865.04	6,561.17	6,556.90	-236.82			

DIRECTIONAL SURVEY CALCULATION
MINIMUM CURVATURE METHOD

Well Name	Target Direction	Slot Coordinate	N / S	E / W	Hole Size	Calculation by	Date
Bernice 2-17H	357.89						4/18/12
Job Number	Type of Survey	Tie-in Point				Directional Co.	
0							

Meaured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate N + / S -	E + / W -	Dogleg Severity	Build Up °/100 ft	Walk/ °/100 ft
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
0	0	0		4,865.04	6,561.17	6,556.90	-236.82			
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